Untitled

Examine the data

```
head(mpg)
```

```
## # A tibble: 6 x 11
##   manufacturer model displ  year   cyl      trans   drv   cty   hwy    fl
##          <chr> <chr> <dbl> <int> <int>      <chr> <chr> <int> <int> <chr>
## 1         audi    a4   1.8  1999     4   auto(l5)     f    18    29     p
## 2         audi    a4   1.8  1999     4 manual(m5)     f    21    29     p
## 3         audi    a4   2.0  2008     4 manual(m6)     f    20    31     p
## 4         audi    a4   2.0  2008     4   auto(av)     f    21    30     p
## 5         audi    a4   2.8  1999     6   auto(l5)     f    16    26     p
## 6         audi    a4   2.8  1999     6 manual(m5)     f    18    26     p
## # ... with 1 more variables: class <chr>
```

```
dim(mpg)
```

```
## [1] 234  11
```

```
mpg.2008<-mpg[mpg$year==2008,]

head(mpg.2008)
```

```
## # A tibble: 6 x 11
##   manufacturer      model displ  year   cyl      trans   drv   cty   hwy
##          <chr>      <chr> <dbl> <int> <int>      <chr> <chr> <int> <int>
## 1         audi         a4   2.0  2008     4 manual(m6)     f    20    31
## 2         audi         a4   2.0  2008     4   auto(av)     f    21    30
## 3         audi         a4   3.1  2008     6   auto(av)     f    18    27
## 4         audi a4 quattro   2.0  2008     4 manual(m6)     4    20    28
## 5         audi a4 quattro   2.0  2008     4   auto(s6)     4    19    27
## 6         audi a4 quattro   3.1  2008     6   auto(s6)     4    17    25
## # ... with 2 more variables: fl <chr>, class <chr>
```

```
levels(as.factor(mpg$year))
```

```
## [1] "1999" "2008"
```

is there a relationship between engine displacement and highway mileage?

```
cor(mpg.2008$hwy,mpg.2008$displ)
```

```
## [1] -0.7702636
```

```
m1 <- lm(hwy~displ,data=mpg.2008)

summary(m1)
```

```
##
## Call:
## lm(formula = hwy ~ displ, data = mpg.2008)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -7.8595 -2.7816 -0.2103  2.1750 12.1059
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  36.1367     1.0387   34.79   <2e-16 ***
## displ        -3.4632     0.2674  -12.95   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.746 on 115 degrees of freedom
## Multiple R-squared:  0.5933, Adjusted R-squared:  0.5898
## F-statistic: 167.8 on 1 and 115 DF,  p-value: < 2.2e-16
```